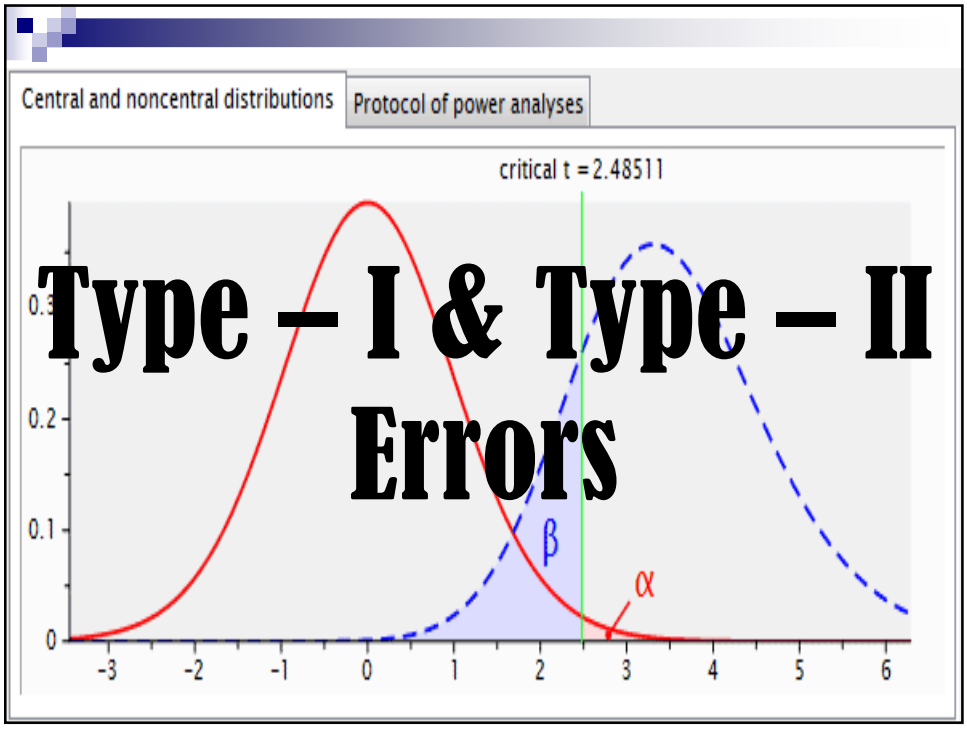


Type – I & Type – II Errors

Type I and Type II Errors:

When testing a null hypothesis, we arrive at a conclusion of rejecting it or failing to reject it. Such conclusions are sometimes correct and sometimes wrong even if we do everything correctly. Errors exists.

Type I error: The mistake of *rejecting the null hypothesis* when it is actually true is α = P(type I error); thus, we would like to keep it small. For type I errors with more serious consequences, select smaller values of α. $\alpha = P(\text{Reject } H_0 \mid H_0 \text{ is actually true})$

In other words, a true null hypothesis can be incorrectly rejected

Type II error: The mistake of *failing to reject the null hypothesis* when it is actually false. β = P(type II error)

$\beta = P(\text{Failing to Reject } H_0 \mid H_0 \text{ is actually false})$

In other words, a false null hypothesis can fail to be rejected.

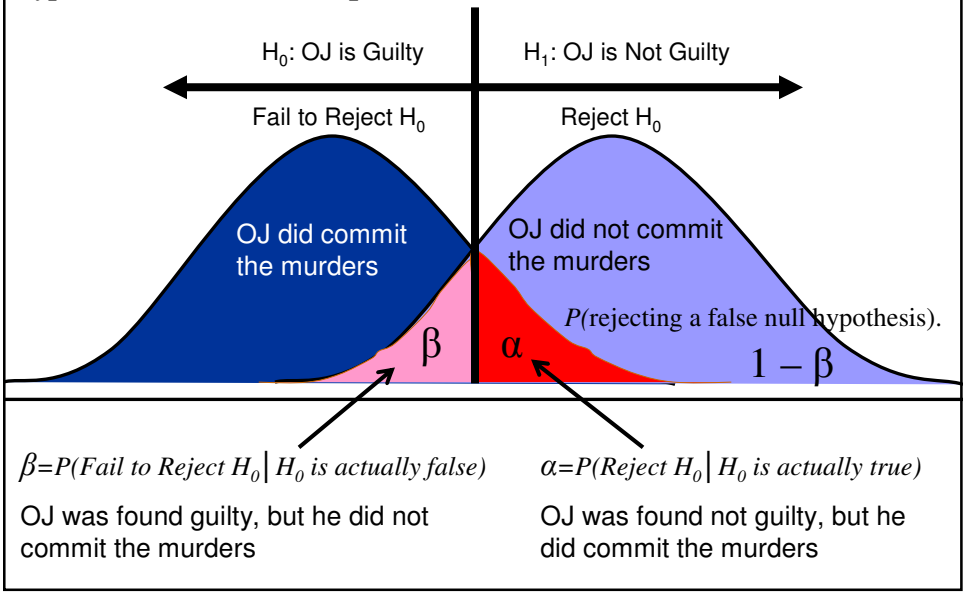
We selected the significance level $\alpha = P$(type I error). However, we don't select $\beta = P$(type II error). It would be ideal to have $\alpha=0$ and $\beta=0$. Mathematically, α, β, and the sample size n are related. We usually select the values of α and n, so the value of β is determined.

		True State of Nature: The null hypothesis is true.	True State of Nature: The null hypothesis is false.
Decision	We decide to reject the null hypothesis.	Type I error (rejecting a true null hypothesis) α	$1-\beta$ Correct decision
	We fail to reject the null hypothesis.	Correct decision	Type II error (failing to reject a false null hypothesis) β

$1 - \beta$ = **Power** of the test = P(rejecting a false null hypothesis).

That is, the power of a hypothesis test is the probability of supporting an alternative hypothesis that is true.

Identify the Type I and Type II Error that correspond to the given hypothesis: **The OJ Simpson Trial**



$\beta = P(\text{Fail to Reject } H_0 \mid H_0 \text{ is actually false})$

OJ was found guilty, but he did not commit the murders

$\alpha = P(\text{Reject } H_0 \mid H_0 \text{ is actually true})$

OJ was found not guilty, but he did commit the murders